the governors additional professor of physics, and Mr. S. Herbert Cox as full-time professor of mining. An additional professor of zoology, a professor of metallurgy, and an assistant professor of botany are to be appointed shortly.

THE Manchester Microscopical Society is doing some excellent pioneer work through the agency of its extension section, the objects of which are to spread the knowledge of microscopy and natural history among outside associations by means of lectures and demonstrations. We have received a copy of the society's lecture list for 1908–9, and find that local associations in or near Manchester may select from forty-seven lectures on botanical, zoological, and nature-study subjects, which certain members of the society are willing to deliver gratuitously. The associations securing the services of lecturers are expected to pay for hire of lantern-slides, travelling and out-of-pocket expenses only. The Manchester Microscopical Society is to be congratulated upon its efforts to bring scientific knowledge, in a popular form, before associations of persons anxious to be instructed. Full particulars of this enterprising scheme may be obtained from Mr. R. Howarth, honorary secretary of the section, 90 George Street, Cheetham Hill, Manchester.

WE have received from Prof. L. Weber, of the University of Kiel, a copy of his report to the Magistrate of Kiel on the daylight illumination of the various primary and secondary schools of the town, thirty-four in number. At each of these schools measurements have been made of the illumination of a surface placed horizontally on desks selected as the best, medium, and worst illuminated, in about four of the most representative of the rooms of the school, on days when the illuminating power of the sky was known. In addition, the solid angle subtended by the portion of sky visible from each of the three desks, and that subtended by the sky visible from the middle window of each of the rooms tested, were observed. The report contains a description of the apparatus used, and details of some of the most interesting cases are given. Prof. Weber considers that an illumination equal to thirty candles at a metre distance throughout the darkest month should be taken as a minimum, and on this basis about 5 per cent. of the rooms tested are deficient, and should be improved by the provision of larger windows or by the trees in front of the windows being trimmed. In congratulating Kiel on the wisdom it has displayed in having an investigation of this kind carried out, one is tempted to ask whether any town of the size of Kiel in this country has ever thought it worth its while to have such measurements made, or is everyone too much absorbed in the educational controversy to think of the eyesight of the child?

EARL PERCY took part in the debate on the Indian Budget in the House of Commons on July 22, and in his speech gave a prominent place to the problems of Indian education. After instituting a comparison between the conditions of elementary education in this country and in India, he said that in England our system of education is directed towards preparation for an industrial career. In India almost the only industry is agriculture, but the system does nothing to qualify the people for their calling in life, and any special aptitude finds no outlet except in the law or in Government employment. Speaking of technical education, he remarked that it is seven years since a conference at Simla went into all the phases of Indian education, primary, secondary, and technical, and passed an enormous number of resolutions, upon which it was expected prompt action would have been taken. The resolutions dealt with the neglect of the study of the vernacular, recommending that it should be carried on throughout; that the results of examination should be taken as passports to the universities and Government employment; that in secondary schools a modern side should prepare pupils for a commercial career; that relations should be established between school authorities and chambers of commerce; and, lastly, the subject of technical education was dealt with in a valuable report. Industrial institutions were recommended for the different provinces connected with special local industries, with a system of apprenticeship in workshops under the supervision of Europeans, and the training of village schoolmasters in tillage. Are we really making substantial progress in any of these directions? he asked, and answered the question by saying the whole reforming energy of the Government seems to have been directed to the universities. The increase in educational expenditure has taken place on too low a basis; the total amount is almost insignificant. How can we ask the Indian to believe that his own Government, which in the last three or four years has sacrificed three or four millions of revenue from the salt duty and opium, and is contemplating large borrowing powers, cannot find money enough to spend on the development of technical education, which is of vital interest if the people of India are to be prepared to take their proper part in the development of industries? With regard to the general administration of education, Earl Percy thinks we shall never get any real enthusiasm or progress until the administration is reformed. There is now a director-general of education, but it is still the fact that, not only is there no member for education in the Viceroy's Council, but the director-general, if he wishes to bring any educational matter before the member who represents the home department, has to do so through the ordinary machinery of the office. Earl Percy expressed the opinion that, having a member on the Council directly representative of and responsible for education, the director-general ought to be given the same right and privilege of free access to the Viceroy which it is proposed to give to the new President of the Railway Board.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 7.—"Seleno-aluminium Bridges." By Prof. George M. **Minchin**, F.R.S.

A seleno-aluminium bridge consists of two plates, P, Q, of aluminium separated by a very thin flake of mica and having a thin layer of sensitive (or conducting) selenium spread across one edge of the mica and the two adjacent portions of the aluminium plates. We have thus the separator of mica bridged over by the selenium, which, of course, adheres to the two aluminium plates. If before the bridge of selenium connected these plates, P, Q, the plates were connected in series with a battery and a galvanometer, no current would flow, but when the selenium bridges over the mica separator, the current passes. Let C_0 denote the strength of this current when the bridge is completely screened from light. C_0 will, of course, depend on the voltage of the battery and the thickness of the mica separator, as well as on the length of the edge of mica covered by the selenium.

If now the selenium layer is exposed to light, the current will be increased—multiplied five times, or more, if daylight is allowed to fall on the selenium.

Owing to the extreme thinness of the mica, the intensity of the light along any line of a spectrum (say that of a star) can be measured if we know the way in which the current-strength, C, depends on the intensity, i, of the light. The main object of experiments carried out recently in the electrical laboratory at Oxford was to discover the relation between C and i. After many assumptions of the form $C = C_0 + k\sqrt{i}$, and others, it was found that no such assumptions satisfy the observations, but that an equation of the form $\log \frac{C}{C_0} = ki^n$, where k and n are constants for the particular kind of light employed, agrees very well with experiment. Thus, suppose that we are using red light of a particular wave-length, let C_1 be the value of current when the intensity of this light is i_1, and let C be the current when the intensity is i; then our equation is

$$\log \frac{C}{C_0} = \left(\frac{i}{i_1}\right)^n \log \frac{C}{C_0} \quad . \quad . \quad . \quad . \quad . \quad (1)$$

The red light employed was that obtained by passing the light of a Nernst lamp through a thick column of water (to cut off heat), and then through a solution of fuchsine. This light was passed along a dark cylinder 6 metres long, the length of which could be varied by removing metre lengths successively, and, as the selenium bridge was at one end of this cylinder, i was varied. Blue light

was also used in this way, and it was found that n is not the same for blue as for red: for the first $n=0{\cdot}36$, and for the second $n=0{\cdot}25$, nearly. Thus it appears that the method of measuring light which consists of various colours by exposing a selenium resistance to the compound light is erroneous; the light must be broken into a spectrum, and the intensity measured in each part.

A selenium bridge possesses the peculiarity (which was noticed by Adams and Day in their experiments) that, once it has been exposed to light, while a current is passing through it, its resistance is not the same to currents passing in one direction as to currents passing in the opposite direction, and apparently the two resistances never again become equal.

Moreover, the resistance to a current of given direction *depends on the voltage*. It was found that if c is the conductivity of the bridge when the voltage of the battery is V,

$$c=kV+k', \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

where k, k' are constants. Thus the conductivity is a linear function of the voltage, but this will not be found unless the observer allows the current to run for several minutes. When light falls on the bridge, the current produced increases as the exposure is continued. With red light the current rises very rapidly, and after, perhaps, forty-five seconds moves slowly towards an asymptotic value. With blue light the rise of current at the instant of exposure is much slower. The curve the ordinates of which are the values of C and abscissæ the times, t, has an equation of the form

$$(H-C)^{-m}-(H-C_0)^{-m}=\lambda t, \quad . \quad . \quad . \quad (3)$$

where H (the final value of C), m, and λ are constants depending on the colour of the light.

The curve is hyperbolic in appearance.

Finally, a spectrum was formed by passing the light of the Nernst lamp through quartz lenses and prisms, and it was found that the effect is a maximum in the red near the yellow, and that effects are produced in and a little beyond the violet, while at the infra red end the effects extended to more than a whole spectrum length. The radiation of a very hot, but invisible, metal ball produces scarcely any effect, even at a small distance from the bridge.

Geological Society, June 17.—Prof. W. J. Sollas, F.R.S., president, in the chair.—The hornblendic rocks of Glendalough and Greystones (co. Wicklow): J. Allan **Thomson.** Both these rocks are intrusive into Ordovician strata in the east of county Wicklow, the former occurring as a small boss in the south side of Camaderry, a ridge which separates the Vale of Glendalough from the valley of Glendrosan, while the latter occur as three dykes traversing the sedimentary rocks on the shore at Greystones. The Glendalough rock is older than the Great Wicklow Granite, and exhibits much heterogeneity in composition. The Ordovician sediments are converted into hornfels at the contact with the igneous rock, and this type of rock has resisted the dynamic metamorphism which occurs elsewhere in the district. The Greystones rock shows a transformation from peridotite into amphibolite, but with a greater development of talc. Olivine and rarely mica are present in the original rock.—On the occurrence of footprints in the Lower Sandstones of the Exeter district: A. W. **Clayden.** Suitable exposures in the "Lower Sandstones" of the Geological Survey map are very rare. Dr. Shapter has recorded "claw-like footmarks," &c., from a locality about half a mile north-east of Broadclyst. Another quarry has been recently re-opened here for building-stone, and, on a search being made, slabs with footprints were found by the author and his students. Later, a slab with a track containing thirty pairs of footprints was found. In all, five specimens have been secured, and three of the sets of prints may have been made by the same individual, one with fore and hind feet about the same size and bearing about the same weight. The two other sets of prints were made by smaller and different individuals.—The basic intrusion of Bartestree, near Hereford: Prof. S. H. **Reynolds.** The Bartestree dyke, which has a thickness of about 35 feet, strikes in an east-north-easterly direction through the Old Red Marls and Sandstones, which for a distance of at least 10 feet from the contact are strongly metamorphosed, the marl being converted into a hard purplish-grey rock with yellow patches, while in the sandstone the felspars are re-crystallised and the quartz-grains corroded. The dyke itself is not a single uniform intrusion, but a multiple dyke composed of several allied though differing types of dolerite and basalt.

Challenger Society, June 24.—Prof. d'A. W. Thompson in the chair.—Oceanography in America: Prof. C. A. **Kofoid.** The recent traverses of the interesting stretch of ocean lying between the Galapagos and Easter Island, on the one hand, and the S. American coast on the other, made by Prof. Agassiz in the U.S. Fish Commission steamer *Albatross*, with which the speaker had been associated, were described in detail, and valuable conclusions drawn as to the influence of currents, up-welling, and eddies on the richness or poverty of both plankton and benthos. Some of the more important marine stations of the United States, and the character of their work, were also dealt with.

PARIS.

Academy of Sciences, July 20.—M. Bouchard in the chair.—The minerals from the fumaroles of the recent eruption of Etna, and on the existence of boric acid in the existing fumaroles of Vesuvius: A. **Lacroix.** One of the peculiarities of the recent eruption of Etna was the slight intensity of the fumaroles. The latter offered all the usual phenomena, with the exception that the warmest fumaroles contained no copper salts. Those containing ammonium chloride as the principal constituent also contained a notable quantity of fluorine. In the fumaroles of Vesuvius a small quantity of the mineral sassolite was found; this was identified by its hexagonal form, its optical properties, and its chemical properties, the last corresponding to normal boric acid.—The hydrates of strontia and baryta: M. **de Forcrand.** Strontium hydrate can be converted into the anhydrous SrO by heating for a long time in a current of hydrogen at a temperature of 850° C. BaO can be obtained in a similar manner in two or three hours at 780° C. Various intermediate hydrates are described and thermochemical data given.—Remarks on the note of M. Lebedew. The apparent dispersion of light in interstellar pace: G. A. **Tikhoff.** Some new observations on the star RT Perseus, and a reply to the criticisms of M. Lebedew.—Ruled surfaces: M. **Tzitzéica.**—Algebraic functions of two variables: H. W. E. **Jung.**—The points of equilibrium of a fluid in movement: M. **Popovici.**—The periodic solutions of a functional linear equation: Ernest **Esclangon.**—The calculation of the tensions in articulated systems of three dimensions: B. **Mayor.**—A safety apparatus against continuous disturbing sparks in wireless telegraphy: Edouard **Branly.**—The flame spectra of calcium: G. A. **Hemsalech** and C. **de Watteville.** The finely divided substance, pulverised by the electrical method previously described by the authors, was introduced into various flames, air-coal gas, air-hydrogen, oxygen-coal gas, and oxygen-hydrogen, and the observed spectra compared with the arc spectrum (Kayser and Runge).—Variations in the fringes in the photochromes of the spectrum: E. **Rothé.** A study of the conditions necessary to free the photographs from the results of secondary phenomena. Photographs of spectra are submitted to the academy, in which the colours are pure, the exact reproduction of the colours of the spectrum, all the accessory reflections having been suppressed.—Electric and magnetic double refraction of nitrobenzene. Variation with the wave-length: A. **Cotton** and H. **Mouton.** In nitrobenzene, Kerr's phenomenon is exceptionally large, being ninety-seven times that of carbon bisulphide for the yellow mercury line. Within the experimental error of the experiments, the dispersion of the electric double refraction of nitrobenzene is the same as the dispersion of the magnetic double refraction.—A case of anomalous rotatory dispersion; application of the measurements of rotatory dispersion to the study of the composition of essence of turpentine: Eugène **Darmois.** Some mixtures of dextro- and lævo-rotatory turpentine show an anomalous dispersion: the rotation becomes zero for one colour of the spectrum, and passes through a minimum for another colour.—The reduction of alkaline chloroiridates by oxalates: Marcel **Delépine.** A reply to

a claim for priority by M. Vèzes.—Researches on the ketodiacids: E. E. **Blaise** and H. **Gault.** By saponifying oxalsuccinic ester with cold hydrochloric acid, the authors have succeeded in obtaining α-ketoglutaric acid,

$$CO_2H—CO—CH_2—CH_2—CO_2H.$$

Attempts to generalise this reaction to the alkyl derivatives have not been completely successful.—A new crystallised sugar, perseulose, with seven atoms of carbon: Gabriel **Bertrand.** This new sugar has been obtained by the biochemical oxidation of perseite with the sorbose bacterium, particulars being given of the details of the operation. The sugar has the constitution $C_7H_{14}O_7$; it is lævorotatory, and shows the phenomenon of multirotation. Particulars are given of its reducing power and of its osazone.—The formation of compounds in solutions of tartaric acid and sodium molybdate: P. **Quinet.** The densities of the solutions, rotations, electric resistance, and cryoscopic constants have been studied. The graphical analysis indicates definite compounds between one molecule of tartaric acid and one and two molecules of sodium molybdate.—The alkaline granites of eastern Corsica: Pierre **Termier** and Jacques **Deprat.**—Urohypertensine: J. E. **Abelous** and E. **Bardier.** This substance is extracted from normal human urine by ether, and separated by means of oxalic acid. It acts as an energetic vaso-constrictor, principally of peripheric origin. The hypertensive substance acts by exciting the peripheric ganglia of the great sympathetic, and also, to a minor degree, the muscular fibres of the vessels.—The relative magnitude of the eye and the appreciation of encephalic weight: Louis **Lapicque.**—Contribution to the study of the nucleo-proteids. Researches on the constituents of pepsin: L. **Hugounenq** and A. **Morel.** The authors have applied the method of hydrolysis with hydrofluoric acid, described by them in an earlier paper, to the study of the nitrogenous substances obtained by the hydrolysis of pepsin. Thirteen of these bodies were isolated and their proportions given.—The semi-logical signification of urinary indoxyl. The examination of pus for indol: Ch. **Porcher.** The method for detecting indol in pus is given in detail. Twenty-five observations on pus of different origins showed indol in nine cases only, so that indol is not an invariable constituent of pus. It is noted that when indol occurs in pus it is never in minute quantities.—Researches on the pharmacodynamic action of cyclohexane and some of its derivatives: A. **Brissemoret** and J. **Chevalier.**—Researches on the presence of the rare gases in the atmosphere at various heights: L. Teisserenc **de Bort.** The samples were collected from captive balloons provided with an automatic apparatus for collecting the samples at different known heights. In all the samples, whatever the height of collection, a notable proportion of argon was found; helium was only found in the lower layers up to a height of 10 kilometres, neon being found in all the samples.

CAPE TOWN.

Royal Society of South Africa, June 17.—Mr. S. S. Hough, F.R.S., president, in the chair.—A new Transvaal tick, a variety of *Ixodes pilosus* (Koch): Prof. J. G. **Neumann.**—The distribution and hosts of the New Transvaal tick *Ixodes pilosus howardi,* Neum.: C. W. **Howard.** Mr. Lounsbury, in one of his reports, stated that *I. pilosus* was only found in the Cape Colony in places which were very humid, such as kloofs containing a stream of running water, or in the vicinity of vleis. Apparently, *I. pilosus howardi* was not limited in its distribution to these conditions, since Mr. Howard had taken specimens from places which were more or less dry, unless they could consider Durban as humid, but such places as Leydsdorp and Zoutpansberg, from which some of the specimens were taken, were very arid. The principal host was the dog, but at the Ivy Mine, Moodies, Barberton, a few specimens were found on a cat, and a few on a hedgehog at Pienaars River.—The occurrence of the genus Sphæroplea in South Africa: W. T. **Saxton.** The previously noted localities where the green alga Sphæroplea occurs are the inundated plains of Central Europe, Asia, and America. Specimens were collected in South Africa by Mr. Saxton in a freshwater pool on Dassen Island nearly two years ago, and again recently in pools on Green Point Common by Mr. E. P. Phillips. The alga is interesting as representing a monotypic and rather isolated family, and is the only one of its species known. Diagrams were shown illustrating the structure and life-history.—Some investigations regarding brak (alkali) in Cape Colony soils: Dr. C. F. **Juritz.** Brak or alkali in soil consisted of accumulations of sodium salts. Rainy weather carried them to varying depths, but prolonged dry weather caused their return to the surface. Irrigation tended to accentuate these conditions, hence the adaptability of any tract of country for irrigation depended, other things apart, upon the proportion in the soil of salts which might render it unproductive. To test a soil as to its liability to become brak under irrigation, it was essential to take samples at regular intervals all the way down from the surface to the greatest depth which irrigation water might penetrate. Brak was caused by carbonate, chloride, and sulphate of sodium, the first doing the most and the last the least injury. Natural drainage usually carried these noxious salts seawards, but this was prevented by (1) an impermeable layer below the surface forming a basin; (2) compactness of the soil itself, and (3) a high water-line in the subsoil. Even these obstacles, where frequent rain resulted in an even distribution of salts throughout the soil, were not always sufficient to prevent successful cultivation. The difficulty arose with a scanty rainfall and a warm climate, or long drought after heavy rain; then it became important to ascertain how much salt the soil could contain and still be successfully cultivated. Investigations had been made in the divisions of Herbert, Colesberg, Britstown, Steynsburg, Robertson, and Carnarvon.

CONTENTS.